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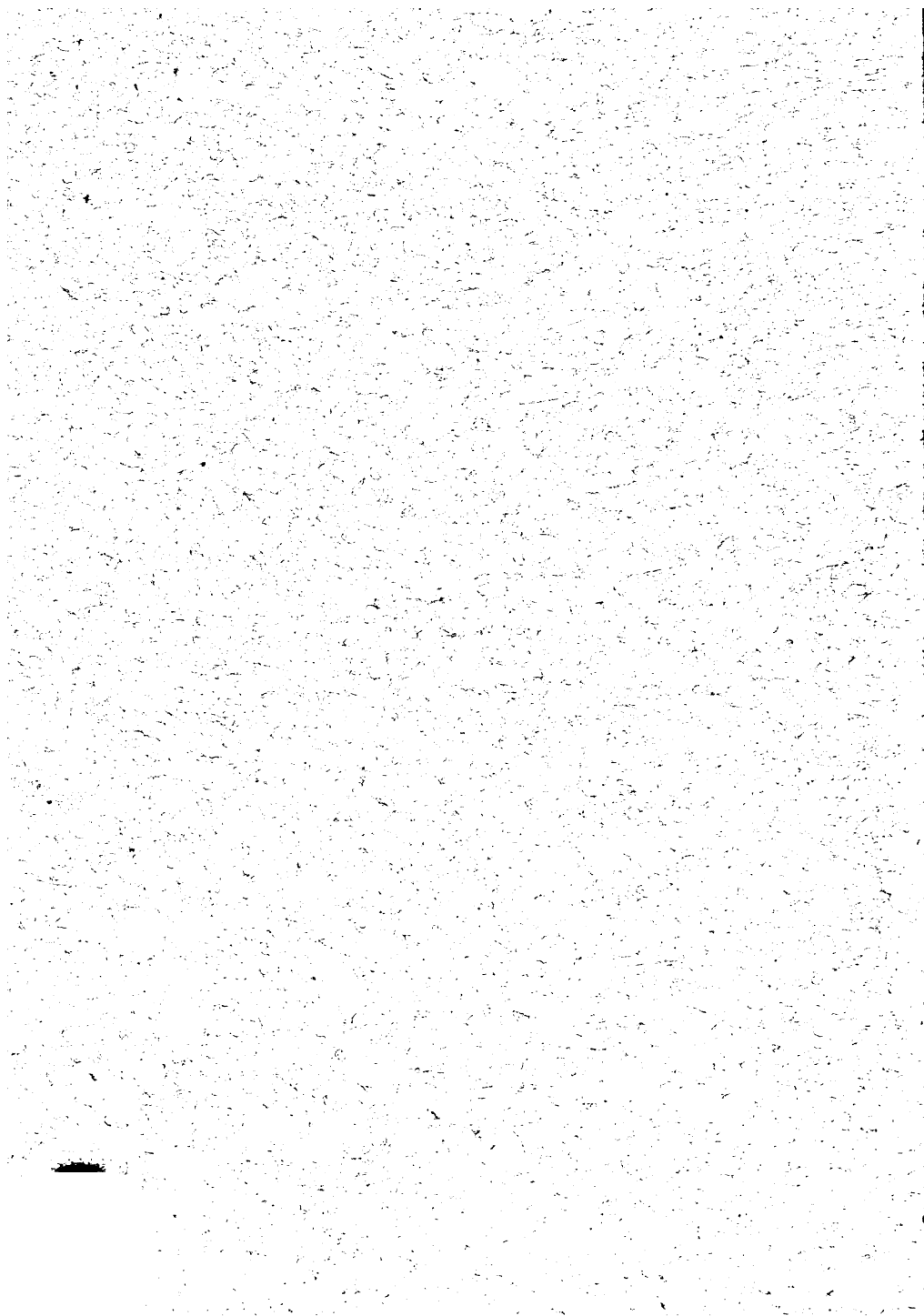
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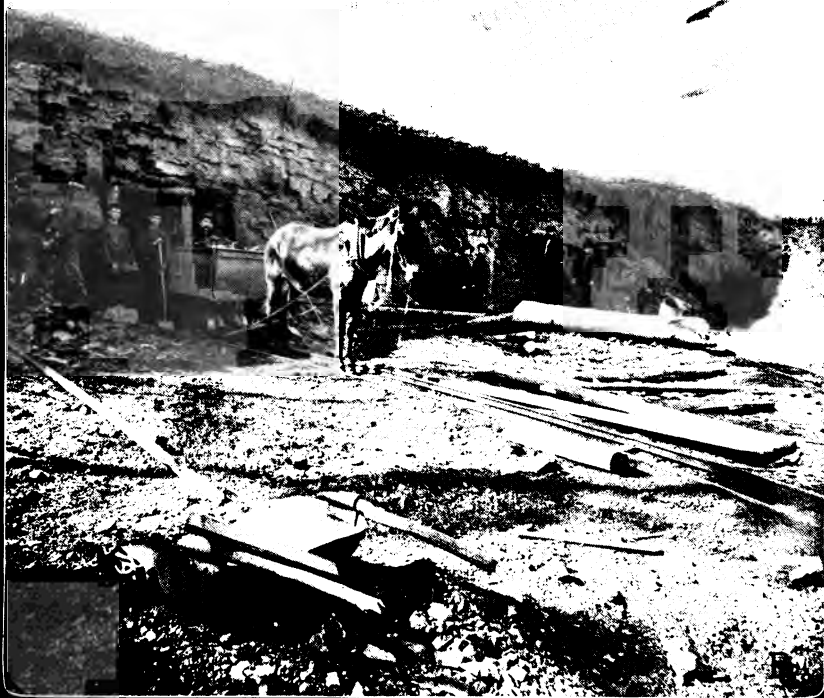
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MINES *and* MINING *in the* **BLACK HILLS**



Burlington and Missouri River railroad company

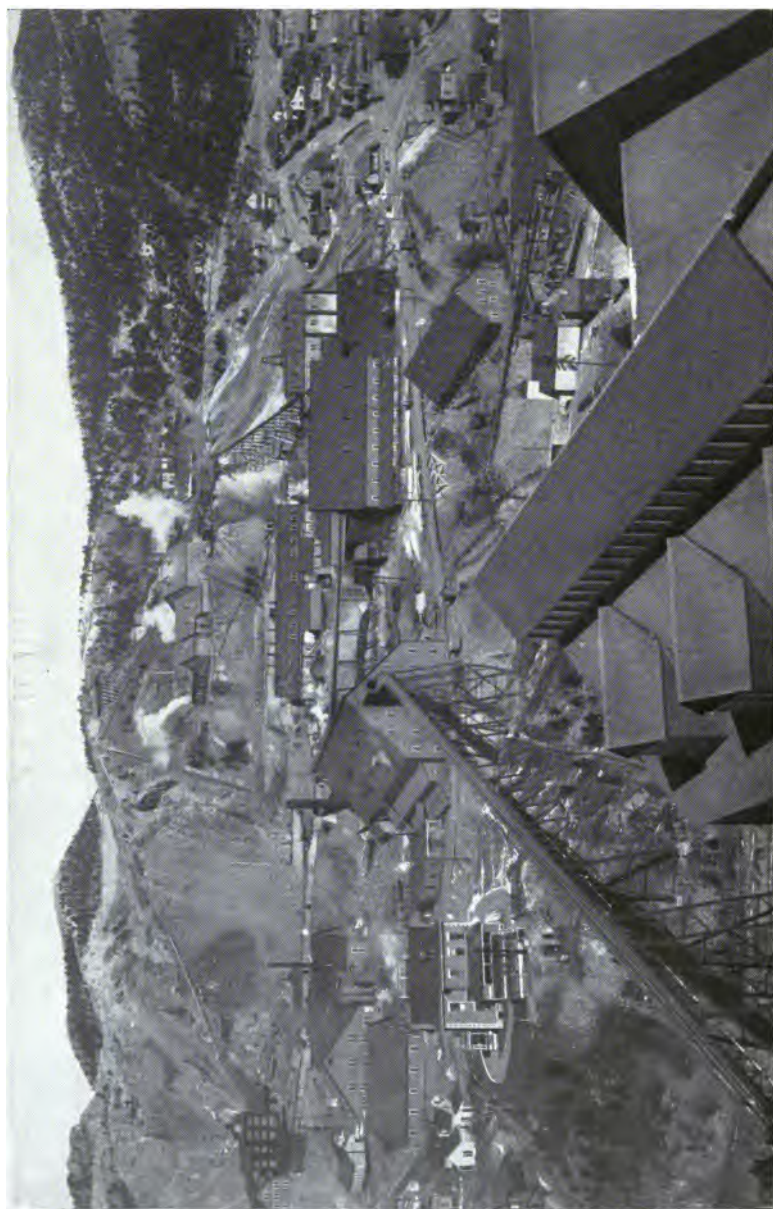
MINES AND MINING IN THE BLACK HILLS

TENTH THOUSAND



PASSENGER DEPARTMENT
BURLINGTON ROUTE

1901



HOMESTAKE MILLS, LEAD CITY, S. D.

AN oblong stretch of country, 120 miles in length by 60 miles in width, running northwest by southeast, rising suddenly from the surface of a level prairie region and breaking into a rugged succession of hills, with here and there sharply defined cañons, is the general appearance of the famous Black Hills, now so widely known as the third greatest gold-producing district on this continent. The geologists are somewhat at a loss to account for this peculiar formation. There is no good reason for the existence of this range of hills in this particular place; nothing to the eastward to justify it, and no clearly established mountain range to the west is met until the Big Horn range is reached; there is no continuous range in the Hills, nor are they a part of any other range, and yet Harney Peak (7,400 feet) is the highest peak found east of the Rocky Mountains proper on this parallel. These are a few of the inconsistencies. The scientists are divided as to whether this curious upheaval was the result of direct volcanic action or lateral pressure.

South Dakota as a state presents some striking features. In the matter of altitude there are wide divergencies. Big Stone Lake is only 967 feet above sea level, nearly 200 feet lower than Omaha, and Harney Peak towers up 7,400 feet. There are plains as level as a floor along James river valley, and narrow cañons hundreds of feet deep in the Black Hills. There are areas where for scores of square miles one searches in vain for a stone, and there are districts which present an almost unbroken surface of rock, and barren places there are which are so saturated with acids and mineral solutions as to be utterly worthless; and again, there are a few ancient "lake beds," forever decaying, barren and desolate—Bad Lands, as they are aptly termed.

The Black Hills proper have an area of about 5,000 square miles, and their true limit is marked distinctly by a sharp ridge of sandstone 300 to 600 feet in height. This ridge is separated from the higher part of the Hills within by Red valley. The altitude of the Hills runs from 3,500 to 6,500 feet. Ten of the geologic ages are represented in the rock formation of this wonderful region and the scientists say that but two of the universal organic elements are lacking here and that this condition does not exist anywhere else in the world.

RICH IN MINERALS.—There is an imposing array of minerals in these Hills interesting alike to the pursuer of wealth, the student, and the scientist. Among the best known are gold, silver, copper, iron, lead, manganese, nickel, tin, graphite, mica, antimony and a list too long to mention in detail. Tin ore has been found which runs as high as 74 and

75 per cent, which is exceptionally high, the best of the famous Cornish mines going only 72 per cent. Minerals not found elsewhere in mountain regions have been discovered here. Wolframite, for example, from which tungstic acid is extracted and used in hardening steel, has been found in limited quantities. It is very valuable, being worth about \$300 per ton, but is easily accessible and mined like common ore, and during the past year several large shipments have been made to iron works in the East. This tungsten ore occurs in considerable quantities near Lead, and also at the Etta group of mines near Kirk on the Burlington & Missouri River Railroad. The most important use of wolfram is in the manufacture of certain classes of crucible steel, where it is used as an alloy. Steel with 5 per cent tungsten is improved in hardness and toughness and has also a self-tempering quality added to it. There is always a demand for wolfram in the chemical market, and Edison used calcium tungstate in photographing with the Roentgen ray. Spodumene is a new mineral found near Hill City on the Burlington & Missouri River Railroad. It contains lithia and resembles stalactite crystals. A considerable amount of this mineral has been shipped to Germany, and there handled by the chemists. The largest spodumene crystals in the world are found in the Etta mine. They resemble great saw-logs two to three feet in diameter, standing at an angle and spangled with beautiful scales of yellow and white mica. Vari-colored marble, lithographic stone and kaolin and mineral paint are all found near Custer City. This Black Hills country is very rich in handsome minerals. In addition to a large variety of quartz, there are beautiful specimens to be obtained of gypsum, massive and fibrous (satin spar), pure white and water clear, laminated (selenite), which comes from the outer rim of the Hills. The rare, four-sided, tapering, transparent, golden-brown crystals of barite that occur associated with the golden calcite from the concretions on the Cheyenne river are not repeated elsewhere, and collectors have sought them eagerly as entirely new. Unfortunately they are scarce. Some of the banded, solid stalagmite from the bottom of the caves has been sawed and polished and is almost as handsome as the Mexican onyx. Chalcedony geodes from the Cheyenne river have been pronounced the finest in the world by one of our largest mineral dealers. What is wonderful about some of them is that enclosed in the solid but hollow walls of silica are crystals of selenite and perfect tiny rhombs of calcite. The finely crystallized walls look like frost and snow sparkling in the sun.

Petrified wood, appearing natural with knots and grain and agatized wood here and there cover the slopes of the Foot Hills and the Bad Lands. Petrified moss and rushes line the warm streams of the southern Hills.

A beautiful variegated breccia or pudding-stone comes from near Buffalo Gap that polishes nicely, also a "calico," or vari-colored, striped sandstone, banded and faulted.

Pyrites of iron, marcasite, saponite, graphite, (found only here, sparingly), galena, flurite, dolomite, dendrite, azurite, malchite, autunite stream tin, blende, orthoclase crystals, andesite, several shades and textures of trachytes, rhyolites, glauconite, chalk, phonolite, hornblende and many other minerals and rocks that occur here might be noted.

EVOLUTION OF MINING.—The evolution of scientific mining has never been more perfectly demonstrated than in the Black Hills today. It is the old story of the first crude attempts up to final completeness. The first discoverers found gold in the gulch creeks; where placer mining existed there must be gold-bearing quartz somewhere, and this was found; samples of the ore were shown by the assayer to carry gold in large quantities. Then the next move was to put up one of the old-fashioned, hard-pounding stamp-mills, and for a time all went well. For the first hundred feet down the ore turned out handsomely—\$25.00, or \$30.00 or \$40.00 per ton. Going a little lower, these figures dropped with alarming rapidity until at, say 150 feet, the quartz ceased to yield. An assay would show that the quartz carried as much gold as ever, but the stamp-mill could not get the metal. Some other process is necessary. This is tried and found successful, and in turn gives way to some still newer and more scientific process, as different ore demanding different treatment is found. And human ingenuity still meets and conquers today the ever-shifting, baffling and elusive moods of nature when she secreted the precious metal in this great treasure-house among the Hills.

SCIENTIFIC MINING.—It may be fairly said that mining is now almost an exact science, at least in so far as its processes are concerned in the treatment of ores. Men with vast sums invested do not make haphazard ventures. Especially to be noted is the constant and persistent experimenting which is going on. Every company, large and small, is on the alert for any new process which will extract gold from the ore at the minimum cost. They now operate with free milling, chlorination and cyanide and a few experimental processes. Cyaniding seems destined to be the greatest of them all.

CYANIDE PROCESS.—The simple fact that twelve cyanide plants are now in operation, four in process of construction and will be in operation within a short time, with six more contemplated and practically assured, should be sufficient to demonstrate beyond a doubt that this process is adapted to a large per cent of the low-grade ore found in the Black Hills, and that they can be made to pay under this method of treatment, whereas with any other they could not. While it is true that not all of the low-grade ores of this district are amenable to this process, it is estimated by those who have made an exhaustive study of the subject that fully 80 per cent of the ores of the Hills do not contain the elements deleterious to cyanide operations.

The successful operation with this process is bringing about the

development of a large area of mining ground. The ore bodies of Ragged Top, Crown Hill, Squaw Creek, Garden City, Blacktail, Sheeptail, Carbonate, to the west and northwest of Deadwood; Yellow Creek, Strawberry, and other districts to the east and south, carry values from \$5.00 to \$15.00 per ton gold. The lime ores of the Ragged Top district and shale ores of the Squaw Creek district are probably the most amenable to the process, the former being found in a district several miles in length, running north and south and divided through the center by the protrusion of Ragged Top Mountain. The ore is very similar in character to that of the Mercur, Utah, ore, found in the lime formation, the depositions carrying values from the surface down to a varying depth. The ore is very porous and does not require fine crushing.

The silicious ores containing iron in the oxidized state are second in amenability to cyanide treatment, giving up their values in six or seven days. The silicious ores most amenable to this process are those of the Crown Hill quartzite type. These ores have an open texture which will admit of coarse crushing. A further variety of silicious ore is found immediately above the quartzite in the form of decomposed shale, which is likewise very amenable and requires a short time for extraction.

In dealing with individual ores in the cyanide process, we must first consider the condition in which the gold appears, together with the association. The cement ores represent a combination of silicious pyrites and free milling gold values, the gold in the free state being usually fairly fine, while in the pyritic state it is generally coarse. A working extraction is obtained on these ores in six to ten days, depending entirely upon the amount of coarse gold present.

There are two methods of crushing the ore in use in the Hills—the dry and the wet—and no two plants are exactly similar. The dry process takes the ore from the crusher through two sets of rolls, and in a dry state is immersed in a cyanide solution, while with the wet process it is pulverized with the stamps, sometimes in water and sometimes in a cyanide solution.

A SAMPLE CYANIDE PLANT.—The Spearfish Gold Mining and Reduction Company, of Colorado Springs, is located in Ragged Top district ten miles west of Deadwood on the Spearfish branch of the Burlington Route. They are now erecting the largest ore-crushing cyanide plant in the state. The great Homestake Cyanide Works, now nearing completion, are larger in every way, but will be used in working over tailings only, while the Spearfish Company's plant, when completed, will be one of the largest ore-crushing cyanide plants in the United States. The outfit of the works will be—eighty horse-power boiler; sixty horse-power engine; 10 x 20 Blake crusher; one set 16 x 36 Davis rolls; two solution storage-tanks, twenty feet in diameter by ten feet deep; ten leaching-tanks, twenty-four feet in diameter by seven feet deep; two gold-solution tanks, sixteen feet in diameter by seven feet deep; two sump tanks, sixteen

feet in diameter by seven feet deep: four zinc boxes; one each solution and vacuum pumps; ore will be crushed to one-half inch; main building, 66 x 144 feet; precipitating rooms, 44 x 72; engine room, 32 x 38; crushing room, 28 x 40. This is lime ore, and said to be the finest cyaniding ore in the Black Hills. The company's holding comprises 320 acres, and they have any amount of ore in sight.

COST OF PROCESSES.—The per cent of gold saved by the different processes will run about as follows: Free milling, about 75 per cent; smelting, practically all of the values contained in the ore; chlorination, about 92 per cent of the gold contents and none of the silver, while the cyanide process saves from 80 to 92 per cent of the gold and about 65 per cent of the silver contained in the ore.

Approximately it may be said that the cost of the treatment of ores by smelting is between \$5.00 and \$6.00 per ton; by the cyanide process, \$3.25 per ton; chlorination may be put down at \$3.75 per ton, while the free milling properties have paid millions of dollars in dividends, mining and milling ore that does not contain to exceed \$4.00 per ton, and some of the larger mills have paid dividends on \$2.00 ore.

The only flux that is not found in the Black Hills is copper ore, which at present is shipped from Butte, Mont. Present developments, however, indicate that an abundance of copper ore will be mined in this vicinity during the coming year. The cost per ton of fluxing ores delivered at the smelter is not made public by the smelting company.

The cyaniding of low-grade ores has furnished one of the best places for investing money to be found anywhere in the Hills. The first cost of a cyanide plant is less than any other process, and when economy is practiced in manipulating the mining mill, the ore can be worked into bullion for not to exceed \$4.00 per ton. Some cyanide plants in the Hills are doing it for \$2.50. On ore that averages \$10.00 per ton gold, the profits of the venture are very great. There are today a great many fine propositions scattered all over the Black Hills, both north and south, where the ore averages \$8.00 and \$10.00 per ton, that will give 90 per cent extraction values.

The successful experiments on very low-grade ores for the past year have demonstrated that millions of tons can now be treated at a profit by the cyanide process that in the past would not have paid the cost of mining and milling, and as a result of these successful experiments capital will be liberally invested in properties that have remained idle for years for the lack of adequate methods of cheap treatment.

WORK FOR DENVER SMELTERS.—The field now open to Denver smelters, by reason of the extension of the Burlington Route, will be in handling concentrates from the southern Black Hills. The northern Hills are largely in possession of the stronger companies, and these large plants will in all probability themselves handle any ore proposition which may come before them. The absence of these larger plants in the southern

Hills, together with the character of the ore shown, the greatly reduced distance via the Alliance-Brush cut-off will undoubtedly combine to stimulate business for the Colorado smelters.

MINING PROPERTIES IN THE BLACK HILLS. In the list which follows it is believed that few, if any, important mining propositions in the Black Hills have been omitted, not intentionally, at any rate. This list will prove of value to every one interested in this famous mining region.

LAWRENCE COUNTY.

Blacktail District.

This mining district is one of the oldest in the Black Hills. The gold-bearing ores are both cement and silicious in character, which yield easily to the cyanide process. The district is about two miles in length, following up Blacktail and Sheeptail canyons, the distance from Deadwood being about two and one-half miles. The creeks in both gulches have been very rich in placer gold and miners are still able to make good wages by working over the old diggings.

GOLDEN GATE MINING COMPANY.—The heaviest shipper of ore in the Blacktail district is the Golden Gate Mining Company, whose stockholders are, for the most part, Chicago people. The company owns a solid block of mining ground over one mile square upon which there are two working shafts, the Moggy and the Kicking Horse. The ore is found in flat shoots, ranging in width from ten to thirty feet, and in thickness from five to thirty feet. The shoots run parallel in a northerly direction, the general average value of the ore being about \$25 per ton gold. The company makes a daily shipment of forty tons of ore to the Deadwood cyanide plant which is under lease to this company.

WELLS FARGO MINE.—A short distance down the gulch from the Kicking Horse shaft is the Wells Fargo mine, which is owned by the Golden Reward Company. There are numerous shoots of ore exposed in the mine. With the improved method of cyaniding, as used in the Black Hills at the present time, the company will be able to treat all the ore exposed at a good profit.

MONTENZUMA MINE.—Shipments of iron and copper ore have commenced from the Montezuma mine, located just outside the city limits of Deadwood on the west. The ore is used at the Deadwood smelter for a flux. About forty tons per day will be mined. This group of claims is bounded on the west by the townsite of Lead and on the east by the city of Deadwood. There are numerous blowouts of copper ore on the surface, with fair values in gold.

DEADBROKE MINE.—R. M. Maloney of Deadwood is operating the Deadbroke mine in this district. There is a ten-stamp mill, with a twen-



DEADWOOD, S. D., THE METROPOLIS OF THE BLACK HILLS REGION.

ty-five ton cyanide annex, which gives a daily capacity of about forty-five tons of ore from the mine. The character of the ore is cement, the average value being \$10 per ton. From \$3 to \$4 per ton is saved on the plates, the rest of the values passing off in the tailings, from which it is saved by the cyanide process. The ore is crushed, passed over the copper plates, and then immersed wet in a cyanide solution where it remains for five to eleven days. This process of wet crushing is commonly used on certain kinds of Black Hills ores. The ore occurs in a shoot which is about three hundred feet wide, forty feet thick, and extends northward several thousand feet.

MINERVA MINE.—The Boston-South Dakota Mining Company has recently purchased the old Minerva mine and stamp-mill, which, in former years, were profitably worked. The mill has been increased from twenty to forty stamps, and a cyanide annex is planned for. The ore is a cement occurring in flat shoots.

ESMERELDA MINE.—Adjoining the Minerva mine is the old Esmerelda property which has made fortunes for a dozen owners who worked, the rich shoots only. It is estimated that there are two hundred thousand tons of cement ore blocked out, having an average value of \$5 per ton gold. The Shawmut Mining Company of Boston purchased the mine and mill this season and a fifty-ton cyanide plant has since been erected and is in successful operation. The company has also purchased the Story Brothers' mine adjoining the Esmerelda on the west.

AMERICAN EXPRESS MINE.—Sheeptail gulch is a tributary to Blacktail gulch, coming in from the west side. The principal mine is the American Express, which has been a heavy producer of \$25 ore. The old company has been reorganized to be called the Imperial of Pittsburg, Pennsylvania, and capitalists are now about to put up a complete cyanide and chlorinating plant. The capacity to be one hundred tons per day and the cost to be in the neighborhood of \$100,000. The plant will be equipped with roasters and all the modern appliances, to make it capable of treating all classes of refractory ores in the Black Hills. The company has bonded a large number of valuable mining claims, making one of the largest mining properties in the district. W. S. Elder of Deadwood, a former owner in the American Express mine, has promoted the deal.

Garden City District.

The mining district of Garden City is situated over the divide west from Blacktail district. There has been a large amount of development work done, but the grade of ore found has been too low to work successfully by the older processes. Cyanide will unlock the treasures of this district.

REALIZATION GROUP.—E. May and associates of Lead City own a group of thirty-six claims, which is the best developed property in the district. A shaft two hundred and fifty feet deep strikes the lower

quartzite, upon which cross-cuts have been made east and west. Several bodies of ore have been encountered, the largest being one hundred feet wide and about six feet thick, with an average value of \$8 per ton gold. The owners of the mine have decided to erect a fifty-ton cyanide plant.

PENOBSCOT MINE.—R. M. Maloney of Deadwood owns the Penobscot mine, which has been worked at different times. The ore has been tested in the Deadbroke cyanide plant, also owned by Mr. Maloney, where it was successfully treated.

OTHER MINES.—Burns & Little own several mines, with large bodies of low-grade cyaniding ore blocked out. The Garden City Mining Company also has plenty of ore, which will cyanide nicely. Garden City as a district offers unusual opportunities for the operation of the cyanide process. There is plenty of water and abundance of low-grade ore. A year ago this season, Curtis Alexander, a chemist from the Kansas City smelter, repaired an old chlorinating mill in the district, converting it into a cyanide plant, in which very successful experiments were made on all of the ores in the camp.

Carbonate District.

Old Carbonate district will be remembered by many people, both in the Black Hills and outside, on account of the great stock boom of 1886. Owing to the falling off in the price of silver most of the mines closed down. It is one of the largest districts in the Black Hills and has a variety of ores. Silver ore is confined to a small area at old Carbonate camp, where a number of mines were operated in early days when the good prices of silver prevailed. Ore shoots, bearing gold and silver, are found on the lower contacts.

IRON HILL MINE.—W. A. Remer of Deadwood has leased this old mine, which, in the early days, was the foundation for one of the greatest stock booms that a mining country ever saw. The mine has the world's premium, taken at the Chicago World's Fair, for the richest piece of horn silver. The mine is by no means worked out. About a car-load per month of the ore is now being taken out and shipped to Denver for treatment.

SPANISH R. MINE.—Another of the early producers of the district was the Spanish R. Mine, owned by the Connors Brothers of Spearfish, S. D. The old shaft has just been retimbered to the 250-foot level, and all of the underground workings have been placed in a condition for active mining. Ore will be broken by the first of the year. A cyanide plant is planned.

TITANIC MINES.—One of the largest blocks of ground owned by one company is that of the Titanic Mining Company, of Deadwood. A patent has just been secured for 715 acres laying in one group. The ground is in the flat formation and a shaft is now under way to the lower

quartzite where ore bodies will undoubtedly be found, as in adjoining districts. The stock of the company is held mostly in the eastern part of South Dakota.

MAGNOLIA MINE.—The organization of the Magnolia Mining Company was perfected last season. The property that will be developed lies next to the Titanic ground, on the northeast. Work of opening up an ore shoot is now in progress. A cyanide plant will be erected.

YANKEE BOY MINE.—Ore shoots of considerable size have been discovered in this mine in Burno gulch. The erection of a cyanide plant near the mine would make the treatment of the ore profitable.

Squaw Creek District.

A prominent mining man from Cripple Creek was recently heard to remark that if he had been carried to the Squaw Creek mining district in the Black Hills blindfolded, and suddenly given his sight again, that he would have imagined himself in the richest mining camp in the world—Cripple Creek. This Squaw Creek camp is in the phonolite belt. The country is considerably broken, and the development work done thus far gives reason for the belief that the district will soon become the greatest producer of ore in Lawrence county.

CLEOPATRA MINE.—That the camp contains ore and that it can be successfully treated by the cyanide process has been thoroughly demonstrated by the Cleopatra Mining Company, R. B. Hughes of Spearfish, S. D., general manager. The company has developed a large block of ground on Squaw creek, and a 100-ton cyanide plant has just been completed. Several thousand tons of ore that will average \$12.00 per ton gold have been blocked out, and there is evidence that the ore bodies are inexhaustible. The Cleopatra cyanide plant is patterned after the Mercur plant in many ways. The ore is delivered 146 feet above the engine-room, and passes through the rolls and down to the tanks by gravity. The company expects to get an extraction of 90 per cent when the ore is better understood. The ore is broken from the upper contacts, 150 feet above the creek level. The distance to lower quartzite is not known, but is supposed to be about 250 feet. Other ore bodies will undoubtedly be found at a future time on the lower contacts.

The Victoria Gold Mining and Milling Co., with a capitalization of 500,000 shares, owns thirteen claims on Squaw creek and the Newark group, in Custer county. The company is composed of Deadwood and Omaha men. Squaw creek property is being developed by a tunnel which is in a distance of about 500 feet. The Newark group is developed by a shaft which shows ore of good value.

IRONSIDES MINE.—The first mining property to be sold to Colorado people was the Old Ironsides, which joins the Cleopatra on the south. The reported price paid for the mine was \$75,000. The capital was fur-

nished mostly by the Portland Mining Company of Colorado Springs, Colo. A steam plant was installed, with air-compressor, and for a time a large force of miners was kept at work on two shifts. A cross-cut tunnel was run several hundred feet which cut five separate verticals of sylvanite ore ranging in value from \$30 to \$210 per ton. Three car-loads of the ore were shipped to Colorado City, Colo., for treatment, one of which gave a return of \$125.00 per ton. The finding of such large bodies of ore in the mine was a surprise to the management of the company. It is now proposed to continue the cross-cut tunnel through the mountain a distance of about 2,000 feet, which, it is practically certain, will open up a number of other very rich ore bodies. The company has already made plans for a 200-ton cyanide plant.

MANCHESTER MINE.—The Squaw Creek Mining Company, of Minneapolis, has developed a fine property at the head of Squaw creek, and considerable ore has been shipped; enough to demonstrate by what process the values in the ore can best be extracted. The ore is both smelting and cyaniding, there being two different classes.

TWO JOHNS MINE.—Adjoining the Manchester mine is the Two Johns, owned by the Two Johns Mining Company, of Chicago. This is another large cyaniding proposition. No less than 4,000 feet of drifts and tunnels have been accomplished in the mine, and a great amount of low-grade and considerable high-grade ore has been encountered. The mine will be worked again soon, using the cyanide process for extraction.

Crown Hill District.

During the Ragged Top boom of 1897-98 Crown Hill mining district was extremely lively. A great deal of development work was done, which disclosed bodies of low-grade ore too low to treat successfully by the old process. There is activity in the district now owing to the ease with which the ore yields to the cyanide process.

CROWN HILL MINE.—There are 6,000 tons of cyaniding ore on a dump at the Crown Hill mine, which will give a profit of \$6.00 per ton when treated by the cyanide process. Shafts and tunnels on the different claims have opened up a number of large ore shoots. S. E. Young of Spokane, S. D., is general manager.

ANNIE CREEK MINE.—The Detroit & Deadwood Mining Company of Detroit and Chicago has one of the finest propositions in the Black Hills. A group of mining claims was leased for a long term, on Annie Creek, and a 100-ton cyanide plant was erected this season. After a run of sixty days the company pronounced this project a complete success. The company has a large amount of ore blocked out, and it is planned to treat a certain amount of custom ore.

OWL MINE.—The Colorado-Black Hills Mining Company has commenced the erection of a fifty-ton cyanide plant on the Owl property in

this district. There is an abundance of ore blocked out which gives a high extraction with the cyanide process.

Ragged Top District.

Ragged Top district had a great boom a few years ago. A singular discovery of gold ore had been made. Prospectors for the precious metals had for years passed over the lime ores of the district, little dreaming that they were treading upon that for which they were seeking. By chance a piece of lime ore was assayed, the result being amazing to the poor prospector. A stampede set in for the district and ground "for miles around" was staked. The boom subsided, but the camp still lived. Ragged Top has produced more rich ore than any other district in the Hills, the general average value being \$100 per ton. The ore is mostly lime in character, which is proving to be especially amenable to the cyanide process.

CALAMITY GULCH MINES.—A company was organized this season, composed of Colorado Springs mining men, known as the Spearfish Gold Mining and Reduction Company. Attracted by the great quantities of lime ore exposed along the surface in the vicinity of Calamity Gulch the promoters of the company purchased nearly 400 acres of ground and a cyanide plant of 200 tons daily capacity has been completed, ready for ore. The plant is one of the most complete, and is the next largest, in the Black Hills. The ore is delivered 100 feet above the solution tanks. It passes through one set of Davis's rolls, thence through a set of Blake's rolls, then to the solution tanks, which are ten in number, each being twenty-four feet in diameter and seven feet deep. The ore is very porous, necessitating its being crushed to about one-half inch mesh. The time of extraction is about ninety-six hours. A full description of this company's outfit has been given on a previous page.

The plant is well supplied with water, there being a storage reservoir of 105,000 gallons at the rear of the plant which has a head pressure of eighty feet. The water is conducted to the mill through a four-inch pipe 4,200 feet in length, the source being a never-failing spring. This is a blanket formation, the ore occurring in shoots about ten feet thick. It is pay ore from the grass roots down. The ore is not mined but quarried like so much building stone. No such proposition is to be found outside of the Black Hills. This is the common opinion expressed by the Colorado mining men who have visited the property. Mining experts, who have made tests on this lime ore with the cyanide process, have pronounced it the ideal ore for that method of extraction. There are a number of groups of mining claims in this district that will afford equally good propositions, worked by the same method as that of the Spearfish Mining Company. The great advantage to small mining corporations which contemplate operating in this district, is the nearness to the railroads, water and the cheapness of the properties.



D. & D. SMELTER AT DEADWOOD, S. D.

BLACK DIAMOND MINE.—Allen, Small and associates are working another of these lime ore propositions. They have a twenty-ton cyanide plant in successful operation, treating the ore from the Black Diamond mine. The plant has been in operation over a year, and an extraction of about 90 per cent of the assay value is now obtained.

AMERICAN MINING COMPANY.—This corporation is one of the largest in the Black Hills. Its financial backers are the Kilpatrick Brothers & Collins of Newcastle, Wyoming. The company bonded about a year ago a great many mining claims, embracing the central part of the Ragged Top district. Former owners put down a shaft about 500 feet deep, known as the Dacy shaft, and the company sunk a diamond drill from the shaft bottom 500 feet farther which encountered the lower quartzite formation. The mining operations were then confined to a shaft down in Spearfish canyon, several hundred feet lower down. The shaft has sunk about 300 feet deep and a cross-cut tunnel is now being run eastward to strike the bottom of the Dacy shaft. This tunnel will be over a mile in length. The theory generally held is that the lower quartzite is covered with a series of ore shoots, the same as in other districts, which are ore producers. The fact that the surface mines in the Ragged Top district produced such rich ore lends color to this theory. The American Mining Company expects to spend a million dollars in development work before a pound of ore is mined.

GOLD HILL MINE.—A shaft is being sunk by the Gold Hill Mining Company of Omaha in Johnston gulch, in this district. Lower quartzite is being looked for.

ULSTER MINE.—This mine is one of the richest in the Black Hills. It has produced only a high-grade ore, the average being \$110 per ton gold.

PORTLAND MINING DISTRICT.—One of the heaviest ore-producing districts is the Portland, which is situated about eight miles southwest of Deadwood. The ore is mined from both the upper and the lower quartzite contacts. It is amenable to the cyanide process and at the present time there is renewed activity in the district on account of the starting up of some of the old properties.

GUNNISON MINE.—Captain Seth Bullock of Deadwood, a man who has had a peculiarly interesting history as a frontiersman in the state of Colorado and later in the Black Hills, has promoted a very strong company in the Dakota Mining and Milling Company which is operating the Gunnison and Jack-Pot mines in the Portland district. Work has been carried on in the mines for a number of years, until there is now not less than 100,000 tons exposed and ready for treatment. The cyanide process has unlocked the treasures of the mine. The company has erected a small experimental cyanide plant at Central City, and for six months past

the ore has been thoroughly tested, the results being very satisfactory. The plant is to be enlarged to 100 tons daily capacity.

PORTLAND MINES.—There are a number of mines in a group in the district that are being worked by the Clinton, Buxton and Portland Mining Companies, which are practically under one management, the headquarters being at Clinton, Iowa. The companies are working large ore shoots in the upper contacts near the summit of the mountain. The Decorah mine, which is located on the lower quartzite, was recently purchased. Ore bodies have been opened up in that mine. The ore from the different properties has been shipped to the cyanide plant and smelter in Deadwood. The companies have now purchased a twenty-stamp mill at Central City, and a fifty-ton cyanide annex has just been completed.

BEN HUR MINE.—Three miners of Terry have a lease on the Ben Hur mine, in Nevada gulch. Two ore shoots have been opened up and shipments of ore are being made to Deadwood.

ALAMEDA MINES.—A rich group of mining claims lies in the Portland district, from which ore has been shipped for a number of years. The Detroit & Deadwood Company of New York and Chicago has purchased the ground from the owners of Montreal, and the ore is to be treated by the company in the new cyanide plant on Annie creek. There are numerous bodies of ore of fair grade.

Ruby Basin District.

The Ruby Basin Mining District has been and is today the principal producer of ore west of Lead. The several mines have kept the large smelting works in Deadwood (also the chlorination plant before its destruction by fire) in ore to the amount of from four to five hundred tons per day. The largest ore shoots in the Black Hills have been encountered in this district. The distance to the lower quartzite is from two to three hundred feet, the ore bodies lying parallel and running in a northerly and southerly direction. The ore in value pays well to ship to the Deadwood ore-treating plants.

GOLDEN REWARD MINES.—The Golden Reward Mining Company now owns most of the producing mines in the district. The ore supply is apparently good for many years. The company recently acquired possession of all of the properties of the Deadwood-Delaware Company, including the large pyritic smelter in Deadwood. The company is the next largest property owner in the Black Hills, ranking second to the Homestake. The ore is amenable to the smelting, chlorinating and cyaniding processes. The company's mines south of Terry produce about 250 tons of ore per day, which is shipped to the smelter for treatment.

HORSESHOE MINES.—In the immediate vicinity of the Golden Reward mines, the Horseshoe Mining Co., of Canada, is operating the Mogul mine, which is one of the heaviest producers of refractory ore in the

Black Hills. The company owns a chlorinating plant at Pluma, on the Burlington Route, capable of treating 150 tons of ore per day. The Mogul has been a phenomenal producer of ore, and the apparent supply is good for a number of years. The company also owns a large tract of mining ground, about 3,000 acres, on Iron Creek, in the Spearfish cañon district. This ground has been patented, and thorough prospecting is now in progress for ore on the quartzite contact. The company has been a payer ever since it commenced mining in the Ruby Basin district. About 125 tons of ore are mined daily.

SUNSET MINE.—South of the Mogul and Fanny mines, properties of the Horseshoe and Golden Reward Companies, the Sunset Mining Company has done a large amount of work developing a wedge-shaped piece of ground which lies between the producing mines. A shaft to the lower contact has been sunk, with drifts east and west, and ore zones of large size have been penetrated, supposed to be the same ore bodies that are being worked in the adjoining mines. The company contemplates building a chlorinating plant.

DELAWARE SHAFT.—The Golden Reward Company has spent a large amount of capital in developing a block of mining ground a short distance south of the Sunset mine. A deep shaft has been sunk to quartzite, and cross-cuts at that level have encountered considerable ore, demonstrating the fact that the ore shoots worked immediately south of Terry are continuous southward at the quartzite level.

North Lead District.

Anything next to the Homestake Mining Company's properties is generally considered good. Such certainly is the case with the mines in the North Lead mining district, which embraces a tract of ground nearly one mile in length and from one-quarter to one-half mile in width. The mines in this district have been worked for twenty years and there are no signs of working out the ore bodies. There is a series of cement ore-shoots, which run through the ground near the surface, crossing Deadwood gulch and again appearing in the Black Hills district, where they are now being worked extensively. Besides the cement ore there are large shoots of silicious ore which is high-grade and easily mined, being near the surface. It is in this district that the new metal, wolframite, is being mined. This metal was discovered not more than two years ago.

HIDDEN FORTUNE MINE.—The world has heard a great deal about the rich discovery of gold ore that was made by Otto P. Th. Grantz in the Hidden Fortune mine, in this district. His discovery was undoubtedly the richest ever made in the Black Hills. For nearly twenty years Mr. Grantz had worked and delved on his three claims in the hopes of striking something rich. One day last fall he happened to pick up a small boulder of rock, which, upon being broken into, proved to be very rich

in free gold. Mr. Grantz immediately commenced sinking a hole in the ground in quest of the mother vein, from which the boulder had come. With a very small amount of work a large shoot of ore was uncovered not more than three feet from the surface. The strike was phenomenally rich. Chunks of ore were taken out that were 80 per cent gold. Assays were made on the ore that went fifty to sixty-five thousand dollars to the ton, gold. Grantz found himself, in a day, with a world-wide reputation and a million-dollar mine. From an excavation about seventy-five feet long, fifteen feet wide, and six feet deep, it is stated that \$200,000 in gold ore was taken out in less than two months. Three car-loads of ore, so rich it was necessary to guard the shipments with armed men, were shipped to Denver for treatment. Two slabs of ore were found in a crevice that were nearly pure gold, the value of each being about \$700. The Grantz shoot of ore, undoubtedly will turn into a vertical vein, in which case there will be few richer mines in the world. Grantz has other ore on his ground. He has one cement bed 150 feet in width and ten feet thick which will give an average assay value of \$8.00 per ton gold. There is also a large amount of selicious ore with a fair value. Wolframite is also found in considerable quantities. Grantz virtually has a mountain of ore. His group of claims before the strike had been offered for sale by him for \$25,000. Nothing less than a million dollars would buy it now. He has recently purchased the Cheyenne group of claims, an old property adjoining his Hidden Fortune group, which has always been considered a rich proposition. Mr. Grantz is a German by birth, and has spent nearly half a century mining in the West. He will erect a cyanide plant in the spring.

GOLDEN CROWN MINE.—The next producing mine south of Grantz is the Golden Crown, which is owned by Lead men. The mine is well developed and several thousand tons of ore are on the dump which is being treated in a twenty-ton cyanide plant that was erected this season by the owners of the mine. The ore yields to the process nicely, giving a high extraction. The plant is to be enlarged.

OMEGA MINE.—This property has been a strong producer for many years. The ore is a cement, and the owners are now milling from ten to twenty tons daily at their cyanide plant, which is located at the mouth of Blacktail gulch. The mine is located at Terraville.

BIG MISSOURI MINE.—The Homestake Mining Company owns, and is at present working, a number of mines containing refractory ores. The Big Missouri mine is one of them. Just what the production is has not been given out by the company.

REDDY MINE.—Lead parties own a very rich mine in this district called the Reddy. Very rich ore has been found in pockets. It is usually worked under lease to other parties.

DURANGO MINE.—This mine is one of the steady producers of ore in the district. It is owned and worked by Lead people. The ore is high-grade, and is found in wide shoots. Considerable wolframite is found with the gold ore.

HARRISON MINE.—Lying next to the Durango, is the Harrison mine, also owned by Lead parties. A large force of men is employed, and regular shipments of ore, which run from \$25.00 to \$115.00 per ton in gold, are made. Wolframite ore is found accompanying most of the gold ore shoots.

Deadwood Gulch District.

Old Deadwood gulch has been called the richest placer mining district in the West. Fortunes have been made in a week from the rich gravel that was found by the early miners. Commencing at a point a short distance below Deadwood, and extending up the gulch about three miles, the gold deposits have been found to be the richest. From the Wheeler claim, located at Gayville, it is stated that the owners took out \$80,000 in gold in less than six weeks. Other claims adjoining produced equally as much. The gravel along the creek is still productive and miners are able to make good wages by working it over. The district is now lively on account of the development work that is in progress on the mountain sides. Numerous rich discoveries of gold ore have been made.

SEIM MINE.—Deadwood parties are working a mine west of Deadwood for iron ore. It is hauled to the Deadwood smelter by wagon. The ore contains some gold, the iron being used for flux.

MURRAY MINE.—The Gladiator Mining Company, of Des Moines, Ia., was organized this season for the purpose of developing the Murray group of claims in this gulch. Numerous verticals of ore have been exposed. Good assays have been obtained and development work now in progress is substantial. A wide vertical of ore will be tapped by a tunnel. The company will erect a cyanide plant.

OLDS MINE.—Up the gulch a short distance from the Murray group is a property in the possession of the University Mining Company, a South Dakota organization. Two verticals of ore are being followed into the mountain. It is in the phonolite formation, resembling the Cripple Creek district greatly. The ore carries fair values.

PENNSYLVANIA MINE.—The Pennsylvania Mining Company has recently commenced development work on a group of claims in this district. A vertical of ore running as high as \$500 per ton gold, is being followed. The company will erect a cyanide plant. Pennsylvania capitalists are furnishing the capital.

BIG FOUR MINE.—A large amount of cyaniding ore has been blocked out in the Big Four Mine by the Big Four Mining Company, of Hamburg, Iowa. Plans are being made for a fifty-ton cyanide plant.



LEAD CITY, S. D., THE MINING CENTER OF THE BLACK HILLS.

RED CLOUD MINE.—This property contains a very rich vertical of gold ore. Assay values run several thousand dollars per ton. Colorado capitalists are negotiating for it.

Yellow Creek District.

This mining district has been an ore producer for a number of years. The ore is a quartzite, carrying values from \$10 to \$100 per ton gold. The district lies south-east of Lead about one mile. The principal shipping point is at Kirk, a station on the Burlington Route.

WASP No. 2 MINE.—The principal ore producer in the district is the Wasp No. 2 mine, which is owned by Deadwood parties. A fifty-ton cyanide plant was erected this season, which is working satisfactorily.

LITTLE BLUE FRACTION.—This mine has a large amount of cyaniding ore. There are a number of mining claims in this vicinity that will be opened up very soon. The ore is especially easy to cyanide.

KIRK MINES.—For some time past a very large mining deal has been pending which embraces a large block of mining ground between Lead and Kirk, the same being traversed by the Burlington Route. The property is bonded to Colorado Springs, Colorado, capitalists. The company having the ground under bond, plans to take it up and sink a shaft to catch the great Homestake lode, which, at the point chosen for the shaft, is believed to be about 1,000 feet below the surface of the ground. The company is able to build up as large a company as the Homestake. Mining men generally agree that the ground is cut by the Homestake lode, the distance from the underground workings of the Homestake company being not more than 4,000 feet from the contemplated shaft.

PLUMA MINE.—A reorganization of the Pluma Mining Company has been affected, and work in the old mine will commence again soon. A cyanide plant is planned, to be operated in connection with a stamp-mill.

HAWKEYE MINE.—A company of Iowa capitalists has a rich mine at Pluma on the Burlington Route, which has been a rich producer of free milling ore. The company is about to sell the property, including a stamp-mill. There are numerous verticals of free-milling ore in the mine, giving a good assay value.

Two-Bit District.

Five miles southeast of Deadwood is the Two-Bit district, which, in the estimation of a good many mining men, is destined to become a great ore producer. Two years ago, the Hardin brothers, who owned a large portion of the district, organized five mining companies, numbering among their stockholders some of the wealthy stockmen of Chicago, and commenced development work on an extensive scale. As a result of certain litigation the mines were closed down. The Hardins are now reor-

ganizing matters, the plan being to consolidate the interests of the five companies into one and then pursue a substantial and thorough system of development at the most favorable place. The original Hardin mine, which is the oldest of the five companies, has been a producer of ore for some time. A shaft to lower quartzite has been drifted from, and large shoots of pyritic ore have been found. Shipments are made regularly to the Deadwood smelter. The Hardin companies have purchased several thousand acres of farming land on Redwater, about ten miles north of Deadwood, where they contemplated, in their original plans, founding a city and erecting large ore-treating plants. Redwater is one of the largest streams of water in the Black Hills. There are a number of smaller prospects in the district which show high values in ore in surface workings.

Little Strawberry District.

There are a number of old mines in the Little Strawberry district, which is situated east of Two Bit. The gulches are rich in placer gold, having been worked since the early days. All of the companies working there are strong financially.

DAKOTA MAID MINE.—Probably the largest amount of ore blocked out in a single mine in the Hills is to be found in the Dakota Maid property, which is owned by Joseph King. A fortune has been spent in the development of the different ore veins. Practically speaking, the ore is everywhere. For a cyaniding proposition it is considered one of the best in the Black Hills. A Colorado syndicate has practically closed a deal for the mine, which means the erection of one of the largest ore-reduction plants in the country.

GILT EDGE MINE.—The Specie Payment Company has cleaned up a fortune from ore shipped from the Gilt Edge mine, located north and adjoining the Dakota Maid. At present, internal complications have arisen among the stockholders, causing a temporary shut-down. One of the largest and richest ore bodies in Lawrence county is exposed in the mine. The company had a lease on the chlorinating works at Rapid City.

ORO FINO MINE.—This old mine has come into possession of the Golden Reward Company. It is to be started up again and worked for the rich galena ore, which will be valuable as a flux in the company's smelter in Deadwood.

Butcher Gulch District.

Some of the richest placer diggings in the Hills have been found in Butcher Gulch district, situated northeast of Little Strawberry Gulch. Even recently nuggets have been found in the old gravel valued as high as \$36.00. At the present time companies are working on the mountain sides.

The Ruby Gold Mining and Milling Company was recently organized to develop property between Strawberry and Butcher gulches. The workings upon this property clearly demonstrate that a series of parallel vertical veins run through the ground. In all of these workings ore has been taken out or exposed, showing values from \$5 to \$17 per ton, gold.

The company is capitalized for 400,000 shares, 50,000 of which have been set aside to be sold for development purposes.

BRONSON MINE.—The British-American Mining Company of Detroit, Michigan, has done a large amount of work on a group of claims at the head of Butcher gulch. A shaft about 250 feet has followed down a vertical of fair-grade ore. The company will erect a cyanide plant at the mine. The mine will develop into a low-grade cyaniding proposition.

BRODY MINE.—Adjoining the British-American mine is a group of claims owned by James Brody, an old prospector. There are numerous shafts and tunnels on the property. At one place, eighty feet from the British-American mine, a vertical of ore twenty inches thick has been followed some distance, which gives assays from \$200 to \$1,200 per ton gold. This rich vein enters the Bronson ground on the east side.

Galena Mining District.

When silver was worth more than it is now, Galena district was very prosperous. A good many mines producing silver were in operation and a number of gold mines were also worked. There is considerable activity in the district at present.

GALENA MINING COMPANY.—This company is doing a large amount of development work on its large tract of ground in this district. The company is the one that was promoted by Francis C. Grable, under the name of the Union Hill Company. The company has been reorganized and plenty of capital is being furnished for substantial development work. Ore has been found in the Hoodoo and Alert workings. The company is backed by wealthy New York city capitalists. It owns a smelting plant at Edgemont, on the Burlington Route, partly finished, and at Galena there is a building erected for a 180-stamp mill.

BULLION MINE.—Dr. H. H. Muggaley of Chicago, has purchased the Bullion mine, which, with the recent development work, has become a rich property. Development work is still in progress. A very large vertical of ore has been cut.

WHITEWOOD PLACER.—The Omaha Mining Company has a rich prospect on Whitewood creek, about seven miles below Deadwood, where an attempt is being made to work out a large placer deposit which is known to be very rich. It is located at the Whitewood falls. The dam of rocks has formed a large deposit of Homestake concentrates which extend several thousand feet up stream. The falls are being tunneled under, and all the sand and gravel will be sluiced.

Bear Gulch District.

There is a large mining district situated about fifteen miles west of Deadwood which is coming to the front rapidly on account of the rich deposits of tin ore that are found there. The district is also very rich in gold quartz ledges in the hills and placer gold in the creeks. The mining camps are reached by the Burlington Route. The district is about equally divided by the South Dakota-Wyoming state line.

AMERICAN TIN MINING COMPANY.—It has been some time since anybody has dared to talk tin ore in the Black Hills. The great tin swindle of the Harney Peak Tin Co., in the Harney Peak tin range in Pennington and Custer counties, dampened the ardor of the best tin-mining enthusiasts. The Harney Peak Tin Co. attempted to mine tin ore that existed around Harney Peak. The capital was put up about equally by American and English people. Mammoth mills were erected and a very large amount of mining ground was purchased at big prices, the promoters of the deal getting an excessively large commission from such sales. The test run that was made at one of the tin mills, to settle the question whether or not the enterprise should be continuous, was a failure. The reason therefor was that there was no sorting of ore, but everything, waste and all, was thrown indiscriminately into the crushers. The result was very unsatisfactory, and in a short time mills and mine were closed down. There are many reasons given out for this tin failure, but it is sufficient to say that the shutdown was not on account of the lack of tin ore in paying quantities.

For over a year eastern capitalists have been making investigations of the great tin belts in the Bear Gulch district. A number of eastern experts have been sent to the Hills from New York City and Philadelphia, and the result is the organization of the American Tin Company of Philadelphia. This company will buy a tract of ground over a mile square. Very strong tin-quartz veins run through the ground, and assays ranging from 1 to 30 per cent are obtainable. A mill-site has been bonded, and extensive operations will soon be commenced.

Bear Gulch has been noted for years for its rich placer diggings and the heavy deposits of stream tin or cassiterite. A shipment of several tons of this stream tin, which was about 70 per cent pure, was sent this season to Cornwall, England.

DEADWOOD-BEAR GULCH MINE.—The Deadwood-Bear Gulch Mining Co. has been reorganized with capitalists from Peoria, Ills., as strong backers. A steam plant has been erected and a shaft is being sunk to lower quartzite.

BEAVER CREEK MINING COMPANY.—This is a Sioux Falls, S. D., company. A shaft is being sunk to the lower ore contact.

ATOKADOS MINE.—Omaha capitalists, including a number of prominent railroad officials of the Burlington Route, have a company called the

Atokados, or So. Dakota spelled backwards. A shaft with favorable prospects is being sunk on Iron creek.

HOMESTAKE MINING COMPANY.—Every mining enterprise in the Black Hills is measured with the Homestake company's possessions. The Homestake has been the standby of the Hills. It has paid dividends—large ones, too—and has kept from one to two thousand men constantly at work for twenty years. The company has paid about \$9,000,000 in dividends up to date. It has paid the largest amount of dividends of any gold mine in the world, and for 1900 it has been exceeded in dividend paying only by the Stratton mine, of Cripple Creek. There are but five mining companies, including copper, silver and lead, which surpass it in the amount of dividends paid up to date. The company has been doing an enormous amount of improvement work about the mine and mills the past year. A million dollars has been spent in securing a water supply alone; a new hoisting-plant has been completed at a cost of \$250,000; a cyanide plant, with a daily capacity of 1,200 tons, has been built at a cost of about \$200,000. The company has repaired, ready for use, the Caledonia and DeSmet stamp-mills, on the north side of Lead hill, which are to be set to work stamping out ore with the increased supply of water. The company employs about 2,200 men, pays out over \$200,000 per month for labor, and supports a city of 8,000 people. The company is liberal in its management, the best scale of wages in the Hills being paid its employees. The dividends will undoubtedly be increased, possibly doubled, when the improvements are finished and the output is increased by the savings made at the cyanide plant on the tailings and the setting to work of more stamps in the Caledonia and DeSmet mills. The ore body now furnishing the ore for the mills is double the width at the 800-foot level to what it was at the surface. The deepest shaft is about 1,100 feet. The principal stockholders of the company are Mrs. Phoebe Hearst, wife of the late Senator Hearst of California, and J. B. Haggin, of New York city. The company will erect very soon, it is stated, another cyanide plant on the north side of the Lead hill for the purpose of saving the values left in the tailings from the stamp-mills.

PENNINGTON COUNTY.

The Black Hills is divided into three mining sections, the Northern Hills for Lawrence county, the Central Hills for Pennington county and the Southern Hills for Custer county. The outside world is more familiar, perhaps, with Lawrence county than with the other two counties for the reason that more substantial development work has been done. Lawrence county is several years ahead of either Pennington or Custer counties. The past year, however, has witnessed a very marked change in feeling on the part of mining investors in respect to investments in the Central and Southern Black Hills. The Holy Terror mine, at Keystone, demon-



HARNEY PEAK TIN MINING COMPANY'S PLANT AT HILL CITY, S. D.

strated several years ago what might be expected by sinking deep on the quartz verticals and a number of other equally as good surface prospects have recently been developed past the danger point.

Keystone Mining District.

The mining district that has attracted the most attention thus far is that of Keystone, which is situated in the central southern part of Pennington county. The Keystone belt of ore is considered the largest and best defined in the Black Hills. It commences at a point about four miles northwest of Keystone and extends southeast nearly twenty miles until it disappears under the limestone near French creek. All along this ore belt numerous outcroppings of gold are made and sufficient development work has been done by prospectors to show conclusively that the belt will, when opened up, be a great producer of gold ore. The Burlington Route has constructed a spur from Hill City to Keystone, cutting through the ore belt.

HOLY TERROR MINE.—The principal mining company at work in the Keystone district is the Holy Terror, which has been a dividend payer for three or more years. The company has paid a dividend of \$172,000 up to date, besides purchasing the properties of the Keystone Mining Company. The ore in the Holy Terror is partly free-milling, there being a large per cent of concentrates. The company has been making experiments with the cyanide process during the past year in hopes that a method may be discovered that will successfully extract the values from the ore in the Keystone Mine and from the concentrates in the Holy Terror ore. The Holy Terror Mine has paid for its own development from the grass roots down, besides paying for costly mills and cyanide plants, and giving its owners a fortune in dividends.

BISMARCK MINE.—Located west of the Holy Terror mine is the Bismarck, owned and operated by the Elizabeth Mining Company, Mr. John Barth of Milwaukee, being the principal owner. The mine has been thoroughly developed. Several veins of free-milling and concentrating ore have been uncovered, and at the 200-foot level the ore is especially fine. The company is also making experiments with the cyanide process. It is possible that a stamp-mill, with cyanide annex, will be put in at the mine.

CHILCOOT MINE.—Eastern capitalists have been developing the Chilcoot mine for the past six months. At the 100-foot level, a wide vein of ore shows values as high as \$100 per ton. The vein is being followed vertically, and it is generally believed that the property has the making of one of the great mines of the district.

GOLDEN RETURN MINE.—The Golden Return Mining Company of Detroit has sunk two shafts on property a mile west of the Holy Terror mine and a wide ledge of free-milling and concentrating ore has been

cross-cut at the bottom of the shafts. The company has recently issued more stock, which was readily taken in Michigan, and it is now proposed to erect a steam hoisting-plant and a mill.

LUCKY BOY MINE.—Michigan capitalists have purchased the Lucky Boy mine, located east of the Holy Terror mine. Considerable development work of a substantial nature has been done, which has opened up numerous ore bodies.

All along the Keystone ore belt prospect holes have been sunk from 50 to 100 feet deep. In some places copper ore has appeared in paying quantities on the surface. The gold ore has been somewhat difficult to treat owing to the quantities of refractory substances which prevent perfect amalgamation. It is believed that the cyanide process, with certain modifications, will give a solution to the extraction problem just as it has to the ore in Lawrence county.

Hill City District.

One of the oldest mining districts in the Black Hills is around Hill City, one of the principal cities in the Hills on the Burlington Route. On all sides of the place are to be found rich veins of ore which resemble in many respects that of the Holy Terror. The city was especially in a flourishing condition during the great Harney Peak tin boom and it still retains much of its old-time push and enterprise.

CLAIRE BELLE MINE.—Frank Hebert and brothers own a very rich mine located about four miles southeast of Hill City. Owing to the construction of a small stamp-mill near the pay-shoot, this mine has recently commenced to pay. The ore vein is nearly vertical, and is about twenty-five feet wide. Some remarkably rich specimens of gold ore have been found near the surface. The general average value of the ore is placed at \$20 per ton. The owners of the mine say that the mine is getting richer with every foot of shaft sunk.

ST. ELMO MINE.—Omaha capitalists have worked successfully a shoot of ore on the St. Elmo property, which lies adjoining the Claire Belle mine. A ten-stamp mill is used in which to treat the ore.

LENA MINE.—This is a newly-opened mine, located four miles north of Hill City. It is owned and operated by the Gopher Mining Company, of Minneapolis, in which two or more prominent newspaper men are interested. A remarkably rich strike of free gold ore has recently been made which is said to rival the Holy Terror rock in richness. The vein is about two feet in thickness, and most of the rock is literally wired together with gold. When the discovery was first made some unknown person stole a few chunks of the precious material, the estimated value of which was placed at \$700. Only the most trusted miners are permitted to work in the mine. The workings of this mine are within sight of the Burlington company's line.

GOLDEN SLIPPER MINE.—East of Hill City about three miles is located the Golden Slipper mine, which is owned by parties residing at Hill City. The mine has a shaft 250 feet deep, with drifts on the ore vein, and sufficient ore has been taken out to pay for all of the mine development. A number of test runs have been made on the ore taken out of the shafts, and the general average of the ore is placed by the owners at \$15 per ton, free-milling. The mine is located at the northern extremity of the Keystone belt, and in every respect the ore ledge resembles that of the Holy Terror mine. A steam hoisting-plant stands over the shaft.

DOLCODE AND TEA LODGE MINES.—These two mines, which adjoin each other, are owned by a Hill City man and a capitalist residing in the East. Shafts and tunnels have been made, and considerable rich ore has been encountered. The Dolcode has a vein of fair size which has yielded very rich ore.

HARNEY PEAK TIN MINES.—The Harney Peak Tin Company, of which mention has been made in a former paragraph, owns a large number of rich mining claims around Hill City which would become rich producers of gold ore if they were only developed. There is a prospect that the company will adjust its internal troubles in such a manner that development work on an extensive scale may be commenced. There is no reason why the company should not be reorganized and again put forth energies in an attempt to make a success at mining the tin ores, of which there is an abundance of sufficiently high grade to pay handsomely at the present price of tin.

SPODUMENE MINE.—One of the very rare minerals in the world is that of spodumene. Recently, shipments of this material have been commenced to Germany, where it is treated in a special way for the lithia which it contains. The latter substance is used for medicinal purposes. About 500 tons will be shipped this season. The principal mine is the Etta, one of the old Harney Peak Tin Company's properties near Hill City.

OTHER MINES.—There are a number of other promising properties around Hill City that could be worked at a profit with capital to erect hoisting-plants and mills. Among these mines are the J. R. mine, Golden Summit, Grizzly Bear, Sunnyside and Bengal Tiger. All of these properties are located directly on the Burlington Route, and they can be made into rich dividend-payers with the expenditure of a moderate amount of capital.

Hornblend Mining District.

But little is known of this very rich mining district outside of the Black Hills. It is situated four miles west of Rochford, a station on the Burlington Route, and at the present time there is unusual activity among

all the mine owners. The first discovery of gold ore in the district was made in the winter of 1897, by August Oberg, while engaged in chopping wood. A stampede set in for the district by Southern Hills people and all of the ground was soon staked. The district is about four miles square, the country being cut by numerous verticals of ore, separated by stratas of hornblend diorite, which usually is impregnated with gold values to a paying degree.

YELLOW BIRD MINE.—This valuable property has been bonded by George B. Best, of Bayfield, Wis. A whim-house and ore-bins have been constructed, and a double-compartment shaft is being sunk on a five-foot vein of free-milling gold ore, which has an average value of about \$9 per ton.

BENEDICT MINE.—This mine, located north of Castle creek, has been bonded to Rapid City and Denver parties, and a shaft is being sunk on a seven-foot vertical of ore which gives an assay value of about \$5.00 per ton gold. A Ford's prospecting stamp-mill has been erected on Castle creek which has been treating successfully for some time the ore taken from the shaft. It is estimated that there are 150,000 tons of ore in sight in the mine.

VICTORIA MINE.—The Victoria Mining Co. of Omaha owns one of the finest groups of mining claims in the district. Numerous shafts have been sunk and tunnels and drifts run, all of which show the same large ore veins as in the Yellow Bird and Benedict.

OTHER MINES.—There are a number of mines open to capitalists in this district that are equally as rich as those above mentioned. They are the North Star, Ethel, Lost Jim, Lost Nig, Black Eagle, Crown, Standard Sampson, Bobby Burns and Evergreen. Through all of these properties the same rich ore veins seem to run, and only a small amount of capital is needed to make big dividend-payers of them.

COCHRAN MINE.—James Cochran owns one of the finest mines in the Black Hills. He has an ore vein over 100 feet wide, there being a streak of ore about 15 feet wide that will average \$15.00 per ton gold. He operates a thirty-ton Huntington mill part of the time, being short of water during the dry part of the season. He has made a fortune from his mine, and resides near the mill with his family.

Pactola Mining District.

On Rapid river, twelve miles east of Mystic, a station on the Burlington Route, is one of the oldest and richest mining sections in the Black Hills, although it is not yet thoroughly developed. Placer mining has been one of the chief methods of getting the gold ever since the first white man entered the camp. Rapid river is the longest stream of water in the mineralized portions of the Black Hills. It is stated that there are forty miles of good placer gravel along the river-bed. The stream is very

swift, and it has been practically impossible to work the live bedrock, owing to the great amount of water to handle.

BIG BEND PLACER MINE.—J. C. Sherman, one of the organizers of the Pactola mining district nearly a quarter of a century ago, still resides in the camp. He organized the Big Bend Mining Co. a short time ago, two prominent capitalists of New York city furnishing the money for the enterprise. A unique system of elevators, belt conveyors, steam dredges and powerful pumps has been set up at a point called the Big Bend, on Rapid river, and the last reports from the company were to the effect that from \$600 to \$1,000 per day was being cleaned up. Nearly fifty men are employed. The company owns over a mile of placer ground along the river. There are several groups of placer claims along the stream that could be worked exactly the same as the Big Bend company's mine, and with as great a profit. The McCurdy Bros. have an especially fine prospect half a mile below Pactola. They farm on the surface, and dig gold from the bedrock of a hundred-acre farm.

POISONED OX AND COPPER GLANCE MINES.—These are two old mines at Pactola, which are now owned by a Minneapolis firm. A copper reef runs north and south through both groups of claims, and there are at least three separate veins of gold ore.

OMEGA MINE.—New York parties own this old mine. A fifteen-stamp mill has been operated successfully. An English syndicate is negotiating for the mine and mill, with the intention of erecting a 200-ton plant. The ore bodies are large, carrying a general average of \$7.00 per ton gold.

GOLD STANDARD MINE.—A Chicago company has patented 600 acres of choice mining ground which has produced considerable ore. A stamp-mill is to be built.

AMERICAN MINES.—The American Mining Co., which is undertaking to exploit lower quartzite in the Ragged Top district, in Lawrence county, at an expenditure of \$1,000,000, has a large group of mining claims in the Pactola District. At one place a shaft has been sunk eighty feet, and a hole has been put down 100 feet deeper with a diamond drill, all in ore. The company will erect extensive works at the mine for the reduction of the ore.

Sheridan Mining District.

Sheridan is a small settlement about five miles east of Hill City. There are a number of very rich deposits of gold and copper ore in the immediate vicinity of the town. Sheridan has the distinction of having held the first session of court in the Black Hills.

BLUE LEAD MINE.—R. M. Maloney of Deadwood and associates, are developing one of the most promising copper properties in the Black Hills. The Blue Lead is located a short distance south of Sheridan, and for twenty years it has been the principal mine in the district. Former



MARBLE QUARRY, NEAR CUSTER, S. D.

owners opened up the copper ledges from the surface and very rich deposits were found. The present management has undertaken to tap the ore deposit near water level, a tunnel over 1,400 feet in length being necessary. The copper ore has given assay values as high as 70 per cent, and a general average value of the entire ledge will not fall much below 10 per cent. The mine is believed to be on the same belt as the Poisoned Ox and Copper Glance at Pactola.

Silver City Mining District.

Silver City mining district has been a great producer of placer gold. Rapid river cuts through the camp, and fortunes have been taken out for several miles along the stream. There are rich quartz ledges on each side of the river, which have been more or less developed.

ARUNDEL ANTIMONY MINE.—One mile north of Silver City is a large group of claims which are attracting attention at present owing to the values in antimony. There is a wide vertical of the ore which has been traced 3,000 feet on the surface by prospect pits. Accompanying the antimony are veins of gold and silver ore which, it is believed, will be rich enough to pay for the mining and treatment charges of the ore, thus leaving the product of antimony clear as a profit. The antimony averages throughout the vein about 30 per cent, while assays have been made that went as high as 50 per cent. A. D. Arundel of Minneapolis has purchased the ground and a thorough development of the property is in progress.

MORROW MINE.—South of the Arundel mine is a smaller group of claims which also shows a large amount of antimony. There is no telling how wide the ore vein is, although it has been opened for over 100 feet across the ledge. This Morrow vein also carries large values in gold and silver.

Rochford Mining District.

Rochford is a station on the Burlington Route, having a population of about 200 people. It is an old camp and is at present lively. There are a number of prosperous mining camps around the town which bring in considerable business for the merchants.

OLD STANDBY MINE.—Some Rapid City men have secured this old mine, and a tunnel is now being run 1,500 feet to tap the main ledge of ore. The mine and mill were in operation until a few years ago, when they were closed down on account of mismanagement. The mine contains a large ore body, free-milling, with a value of about \$5 per ton gold. The tunnel will bring the ore directly to the top of the mill, saving the expense of elevating it 200 feet and then lowering it to the mill, as by the old method.

MONTEZUMA MINE.—At Rochford there is a good opportunity for a safe investment of capital, in the Montezuma mine and mill. The

property was worked successfully for a time, until the ore became too base to free-mill at a profit. It is believed that the ore could be worked successfully by amalgamating the free gold and concentrating or cyaniding the tailings. The ore body is large and has an average value of about \$8 per ton gold.

CUTTYSARK MINE.—This is another old property that can undoubtedly be made into a good payer by using the improved methods of either the cyaniding or concentrating process. The ore has been worked successfully by a ten-stamp mill which is owned by the company.

FAIRVIEW MINE.—A Rapid City party owns the Fairview mine, which is located near Rochford. It has been in operation all of the season. The ore is free-milling and concentrating.

MONTANA MINE.—In the early days this old mine was one of the standbys of the Central Hills. It was worked down to a point where the ore became too refractory to mill and was closed down. The ore is a concentrating proposition, with good values. There is a good stamp-mill at the mine.

ANETA MINE.—A company of Sioux City and Council Bluffs capitalists are developing a property near Nahant. A shaft sixty feet deep has cut through several flat shoots of refractory ore, resembling very much the formation of the Bald Mountain district.

Rochford Copper District.

The Black Hills have been greatly in need of copper ore, especially since the smelting of ore by the pyritic method has become so successful. There would be a number of smelters in operation in the Hills today but for the fact that all copper ore used as a flux must come from Montana or other outside places. For the past two years especial attention has been given to the mining of copper ores. One of the most promising districts is situated about five miles west of Rochford, on the eastern border of the limestone range. Here are to be found immense outcroppings or blow-outs of copper ore extending for miles in a northerly and southerly direction. One of the old theories held by mining experts relative to the deposits of copper ore in the Black Hills, was that all copper indications were merely on the surface and what little copper ore was found had been deposited there during the glacial age. This old idea has been exploded in the past few years by the deep mining that has been done by a few companies. The copper in the Black Hills is invariably found in true fissure veins, a fact that has been demonstrated beyond peradventure. There appears to be two distinct copper-bearing belts in the Hills, one on each side of the mineralized portions of the country. The western belt commences at a point near Deadwood, where the copper veins have been opened up, and extends southward, hugging the limestone range. At frequent intervals the belt has been opened. On the

eastern side of the Hills is to be found a copper belt which is about twenty miles in length. The principal mines are the Blue Lead, Copper Glance and Poisoned Ox.

COPPER CLIFF MINE.—The largest copper district in the Hills is west of Rochford, embracing an area of about five miles in length and two miles in width. Here it seems that the blow-out of copper ore has been unusually strong. The copper Cliff Mining Company is working a group of claims at the north end, where several shafts and tunnels have been excavated. A fine ledge of copper sulphide has been encountered which will average high enough in value to make it a fine proposition. The company is composed of capitalists residing at Ironwood, Michigan.

BRITISH AMERICAN MINE.—Immediately south of the Copper Cliff Mine is one of the largest tracts of mining ground owned by one company in the Black Hills. The company has a deed for over 700 acres of ground. There are millions of tons of copper ore on the surface which was thrown there by the volcanic eruption ages ago. Much of this ore will assay well enough to pay for its treatment. Assays as high as 17 per cent have been made on this blowout ore. The company is now sinking a shaft that will follow down a vertical of ore twenty-five feet wide at the surface, which has a value of about \$5 per ton gold and 3 per cent copper. The company is well backed financially, and it contemplates the erection of large smelting works at the mine as soon as enough ore has been blocked out. This company is also operating in Butcher Gulch, east of Deadwood.

BLACK HILLS COPPER MINE.—South of the British-American ground, the Black Hills Copper Co. has a fine group of claims which also show immense blowouts of copper ore. The company has enough ore on the surface, in the form of outcroppings, to run a 200-ton smelter for many years. At present an incline shaft is being sunk on a large vein of ore which has given excellent assays from the grass roots down. At a depth of 150 feet the vein has widened out considerably and has grown richer. There appears to be at least three separate veins of copper and gold ore running through this company's ground within a radius of 150 feet. The same strong belt extends northward through all of the properties adjoining. The general opinion held is that at a depth of about 300 feet all of the small verticals will come together, forming one of the largest ore bodies in the Black Hills. This company is also backed by capitalists in Michigan, the headquarters being at Benton Harbor.

PELHAM MINE.—The Pelham Mining Co. of Ottumwa, Iowa, has a fine mine on Bogus Jim creek, twelve miles west of Rapid City. A tunnel has been run 220 feet, all in ore, which assays from \$1.50 to \$15.40 per ton gold. A satisfactory test run has been made at a stamp-mill.

CLEVENGER CYANIDE PLANT.—At Rapid City, Howell Clevenger, a student at the State School of Mines, at that city, has in successful ope-

ration a thirty-ton cyanide plant in which he is treating several thousand tons of tailings left from the chlorination works that were in operation there several years ago. The plant is saving about \$7.00 per ton on the tailings.

MYSTIC ELECTRIC-CHLORINATING PLANT.—The Central Hills have long been in need of a custom ore-treating plant. At Mystic, on the Burlington Route, a plant has recently been built which employs a process new to the Black Hills, embracing chlorine and electricity. The plant has a daily capacity of 100 tons of ore, and the tests on ore from every camp in Pennington and Custer counties, also from a few camps in Lawrence county, have been very successful. The company proposes to enlarge the plant to 300 or 500 tons daily capacity, and will put in both the cyanide and the smelting processes. The company is backed by Indiana capitalists. The mill will be the means of opening up a large number of the rich prospects around Mystic, since it affords a market for the ores when mined.

PRESENT PROSPECTS OF THE COUNTY.—Pennington county at present affords a wonderful opening for capital. Within the past two years a great amount of deep mining has been done which has demonstrated that the ore bodies are permanent, increase in value with depth and that they widen out rapidly. Most of the properties are held by the original owners who have kept up their annual assessments and have done what substantial development work was possible with limited means. The county will very soon become a great producer of free-milling and concentrating ore. New methods must be employed in the ore treatment, the same as in Lawrence county. The properties that are sufficiently developed to show defined ore bodies are numerous, and both mines and prospects can be had on easy cash terms or long-time bonds and leases.

CUSTER COUNTY.

The first discovery of gold in the Black Hills was made in the summer of 1874 by H. N. Ross, who is today marshal of the city of Custer. Mr. Ross was a member of the famous Custer expedition, acting in the capacity of chief scout. When the company of soldiers arrived at Custer Mr. Ross and his partner went to a place on French creek, a short distance below Custer townsite, and there panned out a string of colors from the rich placer gravel in the creek-bed. Placer mining has been carried on profitably along French creek and on other streams in the county ever since.

Custer county, like Pennington, is somewhat behind Lawrence county in the amount of actual development work of the mineral districts. But if the mine and claim owners continue to open up properties and make such phenomenally rich discoveries of free gold in the next few years as they have in the past twelve months, the county will soon be in

the front rank as a gold producer. The mining men of Custer county in years past have made a number of unfortunate moves, chief among which was the method employed in the treatment of the ore when mined. Laboring under the theory that all of the ore was free-milling, the mining men erected stamp-mills. This process worked very successfully for the first fifty feet, or such a matter, after which the ore became refractory and refused to yield up its values to the amalgamating process. As a result there are today a dozen or more old stamp-mills in the county standing idle. These old monuments to failure have been holding back the further development of the county. Capitalists coming into the different mining districts were met with the sight of idle mills and unworked mines, and no matter how much truth there was in the reasons given for this inactivity, the man with money kept away. Matters have taken a very different turn in the past year. Custer county has commenced to be looked upon by capitalists as a favored spot. It has been found by experiment that the ore in the county can be treated successfully by two or three processes, foremost among them being the stamp-mill with the cyanide annex. Ore that will average \$8.00 per ton free-milling and concentrating is now considered in the county to be a desirable proposition.

Recently there has been a great deal of deep mining in the county. Up to two years ago the deepest shaft in all the mining districts was not down 100 feet. Now there are shafts from 200 to 350 feet deep in nearly every mining camp in the county. These deep shafts have been sunk on veins of ore which have outcropped at the surface.

Custer county is very rich in rare minerals, metals and non-metallic substances. One prospector has found every kind of metal known in the world, and many precious stones, such as rubies, garnets, agates; crystals of various kinds were also found. Custer county is rich in gold, silver, copper, nickel, antimony, graphite and lead; marble, granite, lithograph stone, fire and pottery clays, alabaster, mica, building slate, paint pigments and coal; the best of Norway pine timber, excellent water courses and health resorts. Such an array of resources is not to be found in any other county in the Black Hills.

NORTH STAR MINE.—An Omaha company is sinking a deep shaft on the North Star property, located eight miles northwest of Custer. At a depth of 300 feet the ore-ledge is ten feet wide and has an average value of \$18 per ton gold. The shaft is to be sunk 500 feet deep.

MAY MINE.—Custer City business men are developing the May mine located on Lightning creek, eleven miles west of Custer. This is the mine that was discovered by the Car Brothers, two cowboys, who found a rich chunk of free gold on the mountain side while looking for their cattle. At a depth of 100 feet the vein is five feet wide, and the ore has an average value of \$100 per ton gold. Some of the ore first taken out of



HOLY TERROR STAMP-MILL AT KEYSTONE, S. D.

the mine was worth \$60,000 a ton. The ore taken out of the shaft in doing the development work has more than paid for the expense of sinking the shaft. The district around the May mine is very rich in placer gold.

LIZZIE MINE.—Located two miles east of Custer is the Lizzie mine, which is owned and operated by the Willow Creek Mining Company of LeMars, Iowa. A shaft over 200 feet deep has followed down a good vertical of ore, and at that depth copper ore has commenced to come into the shaft. The mine will be thoroughly developed.

VIGILANTE MINE.—This is considered a very rich copper mine. It is located about five miles northwest of Custer, and is owned by the Vigilante Mining Company, an eastern corporation. A shaft has been sunk 300 feet, following down a fair-sized vertical of copper and gold ore. The percentage of copper is about three, and there is enough gold with the ore to pay the expenses of mining and milling. The shaft will be sunk deeper.

SPOKANE MINE.—One of the largest ledges of galena ore in the Black Hills is to be found in the Spokane mine, located six miles south of Keystone, across the line in Custer county. The mine is owned by the Crown Hill Mining Company, a South Dakota corporation. The ledge is fully thirty-five feet wide at the 200-foot level, and the general average of the ore is placed at \$60 per ton. The company has erected a 100-ton concentrating plant at the mine, which is working the ore very satisfactorily. The main shaft in the mine is to be sunk 500 feet.

MAYFLOWER MINE.—This old mine, once a producer, is idle for the lack of capital to sink the shaft deeper. The ore ledge is one of the richest in the county. Assays made at the United States assay office, at Deadwood, gave an average of the entire face of the drift, which is twelve feet across, of \$36 per ton, the ore being free-milling. The shaft is seventy feet deep. The ore ledge can be traced a long distance by its clear out-croppings. The ore is a white quartz, showing free gold to the eye.

PENOBSCOT MINE.—In the early days of the county the Penobscot mine was a great producer. It had a twenty-stamp mill in operation and large dividends were paid the owners. As the ore became refractory with depth, it became necessary to close things down. The property is considered very valuable and could be made a payer by putting in a different process for working the ores.

OLD CHARLIE MINE.—This property was also worked in the early days. The ore is telluride, also showing considerable free gold. A stamp-mill stands at the mine and it is practically a sure thing that the ore would yield its values to the free-milling and cyaniding processes. The ore ledge is very strong.

GRAND JUNCTION MINE.—St. Louis capitalists own the Grand Junction mine, located six miles northwest of Custer. This mine is rightfully called the "Homestake" of the Southern Hills. At a depth of 150 feet a cross-cut has been run east and west over 150 feet, and only one wall to the ore-ledge has been found. In nearly every way the proposition is identically the same as that of the Homestake company of Lead in its early days. The grade of the ore is low, averaging about the same as the Homestake did at first. The mine has plenty of water, and all that is lacking to make it the greatest mine in the two southern counties is capital. It is a free-milling and concentrating proposition. J. C. Spencer, the owner of the favorite resort at Sylvan Lake, is one of the lessees.

OLD BILL MINE.—H. N. Ross, of Custer, the same man who made the first discovery of gold in the Black Hills, owns the Old Bill mine, located four miles north of Custer. This mine, in the opinion of many Custer county people, stands next to the Grand Junction in value. A shaft eighty feet deep shows a ledge of ore supposed to be twelve feet wide, although miners who worked below believe that it is nearer fifty feet, since but one wall has been found. The ore is free-milling and concentrating and has an average value of about \$12 per ton gold. There are very rich streaks that will run into the thousands in value. In early days ore was hauled by team to the stamp-mills at Central City, in Lawrence county, for treatment. One wagon load of 700 pounds gave a return of \$57 after being treated. All that the mine lacks at present, to make it a producer, is capital.

UNIVERSITY MINE.—Immediately north of the Old Bill mine is a group of claims recently located by the University Mining Company of Vermillion, S. D. The claims all lie on the same ledge as the Old Bill, and in three separate places gold can be panned out from the surface. The ledges are from four to fifteen feet wide at the out-croppings, and they can be traced through a belt fifteen miles long. On this belt there are eight old mines, including the Grand Junction, which rank among the richest propositions in the Black Hills. The University company has commenced sinking a shaft on one of the most promising ore ledges. The ground was located by the company. It crosses Tenderfoot gulch, which is one of the richest placer diggings in the county. The University mine is but half a mile southeast of the Grand Junction mine.

SALMON MINE.—Northeast of Custer three miles is one of the richest prospects in the county, the Salmon mine. The specimens of free gold that have been taken out of the shallow workings have been equalled by few other mines in the county. The ore is literally filled with wire and fine gold. The owners have held the mine at a very high figure, which precluded its sale. It is now bonded to parties who propose to develop the rich ledge.

OTHER MINES.—There are a great many excellent prospects throughout the county which need only a moderate amount of capital to make of them rich producers of ore. Some of these prospects are: The Granite Reef, located two miles southeast of Custer, on the Grand Divide, which runs from the Harney range on the north, to Pringle on the south. Both gold and copper are found. Southern Queen, a copper mine located twelve miles below Custer on French creek. This property has produced considerable rich copper ore. West Fork mine, located in the Penobscot district, has been well developed with shafts and tunnels, the deepest shaft being 100 feet on a strong ledge of free-milling ore. The Maggie and Aetna, belonging to the Drummer group, also located in the Penobscot district. The Emerine and Mandolin, which show ore veins that will give assays as high as \$1,200 per ton gold. Empire mine and Tom Paine, which are also well developed properties. Practically all of these prospects are developed sufficiently to warrant the expenditure of capital on an extensive scale.

YALE MINE.—The Yale Mining Co. of Michigan has been organized to develop a promising group of claims eight miles northwest of Custer. There are three separate verticals of free-milling ore which undoubtedly come together, forming one large ore body at a depth of possibly 100 feet. A general average of the ore taken from the three veins near the surface is placed at \$24.00 per ton gold. A deep shaft is to be immediately sunk on the most promising vein.

COPPER BUTTE MINE.—A company by the name of the Copper Butte Mining Co. is about to commence sinking a shaft deeper on a promising group of claims northwest of Custer which show good assays of copper.

Mica Prospects.

In the early days of the Black Hills mica was one of the chief products in Custer county. Thousands of dollars worth of this material was shipped out long before there was a railroad nearer than Pierre on the east and Cheyenne on the west. The richest books from many of the mines were shipped out, leaving a lower grade that was not valuable enough to pay the transportation. For the past year interest has been renewed in these mica mines and many of them have been started up again. The Chicago Mica Co. commenced buying mica in the early part of last summer, and also opened up three or four mines on its own account. New discoveries of mica are continually being made all over the county. A New York city mica company has commenced buying, and the prospect is very good for a lively trade among mica-mine owners for the future. The quality of the Custer county mica is excellent, being in special demand for electrical purposes on account of its freedom from iron.

BLACK HILLS MARBLE COMPANY.—The strongest and most progressive company now operating in Custer county is the Black Hills Porcelain

Clay and Marble Co. of Detroit, Mich. The company was organized for the purpose of developing ledges of marble, lithograph stone, black granite, Mexican onyx, kaolin clay, mica and moss agate. In all, the company now possesses over 1,500 acres, located around Custer, and are working the largest force of men in Custer county. Without question, the quality of the marble is the finest in the United States. There is a solid ledge of it extending over a mile and a quarter in length, the average thickness being forty feet. A beautifully tinted moss-agate accompanies the marble in layers. The lithograph stone, which is found west of Custer ten miles, is in layers from four to six feet thick, and there is in reality a mountain of it. The government has examined the stone very recently, and pronounced it equal in quality to the famous Bavarian stone. This stone is worth all the way from twenty-five to sixty cents per pound. The other properties, such as the black granite, mica, kaolin clay and onyx stone, are also very valuable. The company has two mica mines, both producers, and accompanying the white marble east of Custer there is a vertical ledge of kaolin clay which is especially valuable for fine pottery work. Two Chicago companies have been negotiating for the entire output of this mine.

Paint Mill.

At Custer is located a paint factory, where is manufactured a fine quality of paint pigments of different colors. A fine grade of iron ore is mined from the Tilson property at Nahant, on the Burlington Route, north of Custer. The ore is shipped by car-load lots to the mill, where it is ground finer than flour, sacked and shipped to the mining plant at Aurora, Ill. Here it is mixed with oil and put on the market as a superior kind of paint. Two colors of red and two of yellow are made at the Custer mill, the different tints being given at the mixing works by putting together the reds and yellows in different proportions. From the William's mine, at Oreville, on the Burlington Route, a fine grade of graphite is mined, which is also shipped to the Custer mill and ground into a superior kind of graphite pigment. The mill has a capacity of grinding about twenty-four tons of ore per day. It is owned and operated by the Akron Mining and Milling Company of Akron, Ohio. Eighteen men are employed at the mill and ten at the mines.

The Gold Output Since Discovery.

United States Assayer, R. J. Minter, is quoted as placing the output of gold from the Black Hills, since discovery, at \$90,000,000, but it will exceed that amount. Large sums went out of the country in the old days which were never reported to any official. Data secured from newspaper files, from shippers of bullion, and from the State Mine Inspector's

reports, show the following table to be a fairly accurate statement, by years, of the gold produced :

1876.....	\$1,200,000	1889.....	\$3,550,000
1877.....	2,000,000	1890.....	3,904,160
1878.....	2,250,000	1891.....	4,619,270
1879.....	2,500,000	1892.....	5,101,630
1880.....	2,650,000	1893.....	6,750,000
1881.....	2,550,000	1894.....	6,500,000
1882.....	2,550,000	1895.....	6,800,000
1883.....	2,525,000	1896.....	6,775,000
1884.....	2,575,000	1897.....	6,524,761
1885.....	2,750,000	1898.....	7,487,670
1886.....	3,250,000	1899.....	9,131,486
1887.....	3,420,000	1900.....	10,000,000
1888.....	3,485,000		
		Total.....	\$110,848,977

It is safe to say at the close of 1900 that this sum has been taken from the Hills in twenty-four years.

Mr. Minter estimates that the dividends paid by various mines up to June, 1899, were as follows :

Homestake	\$8,750,000	Esmerelda	\$250,000
Golden Reward.....	6,000,000	Minerva	250,000
Horseshoe.	5,000,000	Kicking Horse.....	215,000
Highland.....	3,000,000	Omega	200,000
Portland	2,000,000	The Grantz properties...	200,000
Holy Terror.....	2,000,000	Dead Broke.....	150,000
Gunnison ..	500,000	Uncle Sam	100,000

This shows a total of about \$28,600,000 but there are other good mines whose dividends will swell these figures considerably.

Random Notes.

Gold in the Black Hills was first discovered on French creek, in August, 1874.

Lead has 8,000 population; Deadwood, 7,000; Custer, 1,200; Hill City, 900; Keystone, 700; Rochford, 250; Mystic, 200; Englewood, 150.

Practically all of the soft coal used for fuel and steam purposes in the Black Hills comes from mines not more than fifty miles distant from Deadwood. At Newcastle and Cambria, Wyo., about 1,500 tons are mined daily, which are hauled over the Burlington Route to the different cities and mining camps in the Hills. Northwest of Deadwood about thirty miles, at Hay Creek, are more coal mines. This coal will make an excellent quality of coke, and there is a plan on foot to erect coke furnaces at the mine to supply the smelting works with that material.

This is a golden time for investors in the Black Hills. That rich ore is there in immense quantities no sane man doubts for a moment. The simple fact is there is more gold-bearing quartz in that region than there is capital to work it.



CAMBRIA, WYO., WHICH SUPPLIES MOST OF THE COAL USED IN REFINING BLACK HILLS ORES.

The use of a solution of cyanide of potassium as a lixivant for gold and silver ore was first practiced in South Africa in 1889. The celebrated Mercur mine, in Utah, was the first in this country to use it, in 1892, and was followed by the Revenue mill, in Montana, and a plant at Bodie California, in 1894, and since then its use has spread rapidly.

The State Inspector of Mines reported 2,822 men employed in mines, and 440 placer miners and prospectors, at the close of 1899.

Gold chlorination is a process invented by Prof. C. F. Plattner, of Germany, and was first used in Silesia, in 1848. It was used at Grass Valley, California, in 1857, and Dr. Mears, of Philadelphia, in 1877, patented a process which has been so much improved upon by A. Thies of South Carolina that the method of barrel chlorination receives in America the name of the Thies process. The principle involved is that metallic gold, especially when in a state of fine division, is readily soluble in chlorine, and the chloride of gold thus formed is completely soluble in water. From this water solution the gold can be precipitated by means of ferrous sulphate (proto-sulphate of iron), sulphuretted hydrogen or metallic sulphides, or charcoal, and the precipitated gold may then be collected on a filter, dried, and melted to bullion. If the precipitation be made by sulphuretted hydrogen in a hot, dilute solution, it consists largely of metallic gold; if, however, the solution be cold, (as is usually the case in practice,) sulphide of gold is precipitated, which must be roasted before melting to bullion.

It is a mistake to imagine that all values are gold in the Black Hills region, and it may be a surprise to learn that for several years past, or take it year for year, the cattle and sheep industry, the product of brick, building stone, lumber and farm produce have equaled and sometimes exceeded the gold output in value.

It is always a matter of interest to those who intend to locate to know what the school facilities are, and in this particular the Black Hills are well equipped. In addition to the graded schools, there is the School of Mines at Rapid City; the State Normal School at Spearfish; the Black Hills College, under the direction of the Methodist church, at Hot Springs; and the Catholic Seminary at Sturgis.

A mine that has produced \$65,000,000 in gold in twenty-three years, and has \$98,000,000 in sight, is worthy of consideration even if the ore sometimes does not assay more than \$4.80 to the ton. The Homestake mine has paid \$9,000,000 in dividends to its owners. It represents \$16,000,000 in property and improvements, and since it was first opened over \$40,000,000 has been paid for labor in its development and operation. It is not a single mine but a number of mines all on the same hill and the same lead. A solid body of ore 450 feet in width and of indefinite length has already been uncovered above the 800-foot level, and according to the estimates of the engineers is sufficient to keep all of the mills em-

ployed for twenty years. The present capacity of the mills is 2,800 tons a day, which means 1,022,000 tons a year, 20,440,000 in twenty years. It is estimated that the latter quantity is in sight at present.

In the cyanide process the ore is first crushed, then put into tanks and a solution of cyanide of potassium is poured over it. The cyanide is shipped from the east in crystals and is a deadly poison, but there have been few accidents in its use and those were entirely due to carelessness. After soaking from twenty-four to forty-eight hours the cyanide eats out all the gold and silver in the ore and holds it in solution. The solution is poured over an incline of boxes filled with fine zinc shavings. They are afterwards melted down, the zinc burnt out, and the residue, which is gold with a silver alloy, is poured into molds and allowed to cool. The bricks are sold at the assay office in Deadwood, or shipped east.

From 1851 to 1899 the gold mines of the world produced \$6,665,631,000, which was more than double the world's production for 350 years,—that is, from 1501 to the end of the year 1850—the amount for those three and one-half centuries being \$3,129,720,000. California has produced \$1,400,000,000 since discovery of gold in 1846-49.

How to Reach the Black Hills.

Inspection of the map on the opposite page will give you an idea of the extent of erritory traversed by the Burlington Route.

From Chicago, St. Louis, Peoria, Kansas City, Omaha, Lincoln, Denver, and almost every other town and city west of Chicago, it is the best line to the Black Hills. It is the only line to Lead City and Deadwood which operates dining-cars; the only railroad which runs through sleeping-cars from Omaha and Lincoln to Deadwood. Its track is smooth and solid. Its cars are models of convenience and comfort, and its employees are exceptionally obliging. Best of all—Burlington trains are almost invariably "on time."

Information about rates, tickets, through-car arrangements, baggage, etc., will be cheerfully furnished by any of the company's ticket agents or by any of the representatives of the passenger department whose names and addresses are given below:

ATCHISON, KAS., 407 Commercial St.,	-	-	-	F. T. HELPBINGER, City Passenger Agt.
ATLANTA, GA., 5 North Pryor St.,	-	-	-	J. N. MERRILL, General Southern Agent.
BILLINGS, MONT.,	-	-	-	H. B. SEGUR, General Agent.
BOSTON, MASS., 306 Washington St.,	-	-	W. J. O'MEARA, New England Passenger Agent.	
BURLINGTON, IOWA,	-	-	-	J. M. BECHTEL, Division Passenger Agent.
BUTTE, MONT., 35 East Broadway,	-	-	-	PHIL DANIELS, Traveling Passenger Agent.
CHICAGO, ILL., 211 Clark St.,	-	-	-	F. E. BELL, City Passenger Agent.
CLEVELAND, OHIO, Williamson Building,	-	-	-	W. F. McMILLAN, General Agent.
CINCINNATI, OHIO, 406 Vine St.,	-	-	-	W. M. SHAW, District Passenger Agent.
COUNCIL BLUFFS, IOWA,	-	-	W. J. DAVENPORT, Assistant Division Passenger Agent.	
DALLAS, TEXAS, 267 Main St.,	-	-	-	C. L. BEECH, Texas Passenger Agent.
DEADWOOD, S. D.,	-	-	-	J. L. BENTLEY, Commercial Agent.
DENVER, COLO., 1039 Seventeenth St.,	-	-	-	G. W. VALLERY, General Agent.
				J. MILNER, City Passenger Agent.
				A. B. SCHMIDT, City Ticket Agent.
				F. C. MATTHEWS, Traveling Passenger Agent.
				GEO. F. BARKER, Traveling Passenger Agent.
DUBUQUE, IOWA,	-	-	-	I. DIEPFENDERFER, General Agent.
HELENA, MONT., 6 North Main St.,	-	-	-	H. F. RUGER, Traveling Passenger Agent.
KANSAS CITY, MO., 823 Main St.,	-	-	-	H. L. HARMON, General Southwestern Agent.
				F. C. SHARON, City Passenger Agent.
LEAVENWORTH, KAS.,	-	-	-	C. W. ALEXANDER, General Agent.
LINCOLN, NEB., Tenth and O Sts.,	-	-	G. W. BONNELL, City Passenger and Ticket Agent.	
LOS ANGELES, CAL., 222 S. Spring St.,	-	-	-	W. W. ELLIOTT, Agent.
				J. W. MONAHAN, Traveling Passenger Agent.
MINNEAPOLIS, MINN., 414 Nicollet Ave.,	-	-	-	J. F. McELROY, City Ticket Agent.
NEW YORK CITY, 379 Broadway,	-	-	-	E. J. SWORDS, General Agent.
OMAHA, NEB., 1502 Farnam St.,	-	-	-	J. B. REYNOLDS, City Passenger Agent.
				S. R. DRURY, 1004 Farnam St., Traveling Pass. Agent.
PEORIA, ILL.,	-	-	-	L. PAGE, General Agent.
PHILADELPHIA, PA., 632 Chestnut St.,	-	-	-	HARRY E. HELLER, District Passenger Agent.
PITTSBURG, PA.,	-	-	-	W. V. TAFFNER, General Agent.
PORTLAND, ORE., 100 Third St.,	-	-	-	A. C. SHELTON, General Agent.
				R. B. WILSON, Traveling Passenger Agent.
QUINCY, ILL.,	-	-	-	E. F. BRADFORD, General Agent.
ST. JOSEPH, MO., Cor. Sixth and Felix Sts.,	-	-	-	F. R. McVEITY, City Ticket Agent.
ST. LOUIS, MO., Cor. Broadway and Olive St.,	-	-	-	J. G. DELAPLAINE, City Passenger Agent.
ST. PAUL, MINN., 400 Robert St.,	-	-	-	C. THOMPSON, City Ticket Agent.
SALT LAKE CITY, UTAH, 79 W. 2d South St.,	-	-	-	R. F. NESLEN, General Agent.
				C. P. PRUITT, Traveling Passenger Agent.
				L. W. HAHN, Traveling Passenger Agent.
SAN FRANCISCO, CAL.,	-	-	-	W. D. SANBORN, General Agent.
631 Market St., (Palace Hotel)	-	-	-	E. A. MUDGETT, Ticket Agent.
				E. S. HARRISON, Traveling Passenger Agent.
				C. W. SMITH, City Passenger Agent.
SAN JOSE, CAL., 15 W. Santa Clara St.,	-	-	-	F. E. THOMPSON, Ticket Agent.
SEATTLE, WASH., 103 Pioneer Square,	-	-	-	M. P. BENTON, Agent.
				H. A. SCHAUB, City Passenger Agent.
SPOKANE, WASH, Jamieson Building,	-	-	-	A. B. JACKSON, Traveling Passenger Agent.
TACOMA, WASH., 104 Tenth St.,	-	-	-	J. W. DRAPER, Traveling Passenger Agent.

J. FRANCIS, General Passenger Agent, Omaha, Neb.

Burlington Route

